May Yuan's top ten most significant discoveries and innovations of GIScience

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12/13/08

In David Letterman style

10. Cyberinfrastructure: we started wtih money (DIME) and power (TIGER)

9. Two per family: field/object; raster/vector; geometry/attributes

8. Do you think space is complicated? Try space-time? Get me out of cells and make me an agent.

7. If we get closer, we will be more similar.

6. How long is Maine's coastline? It depends what's the meaning of "is" is.

5. Need higher r-square? No problems, just change scale.

4. Topology is hard, typology is harder. Not enough? Try ontology. How about semantic similarity

3. The certainty about space is uncertainty. Huh?

2. There is no positive relationship, there is no negative relationship, but there is geographically weighted relationship.

1. PPGIS, Mash-up, VGI, geography can't hide anymore.

- 1. The duality of geographic space: raster and vector are two basic frameworks to represent and analyze geographic space; The duality of geographic phenomena: fields and objects are two basic frameworks to conceptualize what constitutes geographic space

- Geospatial cyberinfrastructure: census data, environmental data; combined strengths of CAD and RDBM
3. Scale: need a higher r-square? no problem. Just change the scale of analysis.
4. Spatial autocorrelation: if we get closer, we will be more similar.
5. The certiainty of spatial uncertainty: We can never know it for sure the length of Maine's coastline. Spatial resolution

Infrastructure and spatial database

10. The seeds of cyberinfrastructure

    - Digitization, data sharing, resource sharing: GBF, DIME, TIGER, census, CGIS

    - automated cartography: algorithms and tools

    - metadata, spatial data standards, and infrastructure: FGDC, NSDI, spatial linguistics, ontology, digital gazetteers

9. Spatial data:

    - Combine strengths of CAD and RDBM

    - Spatial data structures, spatial ordering schemes

    - Formalizing topological relationships in databases

Representation and visualization

8. Duality of space

    - spatial conceptualization: fields and objects

    - spatial representation: rasters and vectors

    - spatial constructs: geometry and attributes

7. Complexity and dimensionality

    - space, time, space-time, change, events, processes, dynamics (and narratives)

    - geovisualization

    - spatialization and visual analytics

Geographic measurements and analysis

6. Scale rules

    - certainty of spatial uncertainty

    - fractal dimension: how long is Maine's coastline?

    - need a higher r-square? change the scale of analysis

5. From global to local:

    - spatial autocorrelation

    - spatial neighborhood

    - LISA

    - GWR

GIS Modeling

4. Divide and conquer

    - geographic themes, variables, and data layers

    - spatial overlays

    - map algebra

    - dasymetric mapping

3. From aggregate to disaggregate

    - computationalize time geography

    - cellular automata

    - agent-based modeling

Information Services

2. location-based service and web service

    - interactive on-line maps

    - customized routing and navigation

    - web GIS applications

1. democratize geography

    - ubiquitous spatial thinking and reasoning

    - mash-up local knowledge and global perspectives

    - PPGIS